ISSN (print) 0093-4666 © 2014. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/129.407

Volume 129(2), pp. 407–413 *October–December 2014*

Nomenclatural novelties in the *Postia caesia* complex

Viktor Papp

Department of Botany, Corvinus University of Budapest, H-1118 Budapest, 44 Ménesi st, Hungary

Correspondence to: *viktor.papp@uni-corvinus.hu*

Abstract – Within the genus *Postia*, the *P. caesia* complex forms a distinctive morphological group. Based on recent molecular data, the current taxonomic status of the *P. caesia* complex is discussed and the nomenclature of the related taxa is revised as well. New combinations are: *Postia* subg. *Cyanosporus*, *Postia africana*, *Postia amyloidea*, *Postia caesioflava*, and *Postia coeruleivirens*.

Keywords – polypores, basidiomycetes, *Oligoporus*

Introduction

Based on recent molecular phylogenetic studies, the cosmopolitan polypore genus *Postia* Fr. belongs to the antrodia clade, with members characterized by brown-rot wood decay (Hibbett & Donoghue 2001, Binder et al. 2013). Within the genus, the *Postia caesia* complex forms a distinctive morphological group (Ţura et al. 2008). The foremost species of this complex is *P. caesia* (Schrad.) P. Karst., which was described from Germany (Schrader 1794) but probably has a circumglobal distribution (e.g., Pildain & Rajchenberg 2012, Ryvarden & Gilbertson 1994). The main morphological features of *P. caesia* are annual soft white basidiocarps that become blue-grey when bruised or spontaneously in age and small cylindrical to allantoid cyanophilous basidiospores (Niemelä 2013). In addition to *P. caesia* are similar taxa described from Europe (David 1974, 1980; Niemelä et al. 2001; Pieri & Rivoire 2005) and worldwide (Corner 1989). Species delimitation in this difficult complex has not been sufficiently clarified (Yao et al. 2005), and the generic name of this peculiar polypore group has changed more than once, depending on the various taxonomic concepts held in the past. The current taxonomic status of the *P. caesia* complex is discussed based on recent molecular data and the nomenclature of the related taxa is revised accordingly.

Nomenclature and taxonomy of *Boletus caesius*

McGinty (1909) proposed a new monotypic genus (*Cyanosporus*) for *Polyporus caesius* (Schrad.) Fr., based on its cyanophilous spores. However, the name *Cyanosporus caesius* (Schrad.) McGinty was not accepted in significant studies (e.g., Donk 1960, Jahn 1963, Lowe 1975), while the combination introduced earlier by Murrill (1907), *Tyromyces caesius,* was commonly used. After it became more evident that the species in *Tyromyces* P. Karst. were white-rot-producing fungi, David (1980) placed the brown-rot taxa into *Spongiporus* Murrill, Jülich (1982) combined them into *Postia,* and Gilbertson & Ryvarden (1985) transferred them into *Oligoporus* Bref. Depending on the biological, morphological and anatomical features of the type species, these genera also have been regarded as one genus. *Postia* (Fries 1874) has priority over *Oligoporus* (Brefeld 1888) on the basis of wide acceptance of the validity of Fries's 1874 publication (Karsten 1879, 1881; Donk 1960, Jülich 1982, Larsen & Lombard 1986, Renvall 1992, Walker 1996, Pieri & Rivoire 1998), although some authors (Ryvarden 1991, Ryvarden & Gilbertson 1994) have interpreted "*Postia* Fr." as an invalid provisional name. The phylogenetic study by Yao et al. (1999) also confirmed that there is no difference between *Oligoporus* and *Postia*. Nonetheless, a subsequent phylogenetic study cited by Kotiranta et al. (2009) supported the two genera as independent, with *Oligoporus* containing species with thick-walled and distinctly cyanophilous spores. In contrast and more recently, rDNA ITS and LSU sequence analyses by Pildain & Rajchenberg (2012) place *Postia* s. lat. species in the 'postia clade' regardless of the spore wall thickness. They regard the main features of the 'postia clade' as tetrapolar mating, normal nuclear behavior, metachromatic generative hyphae, and the absence of fiber hyphae in culture. In their phylogenetic study using LSU, ITS, and combined LSU–ITS datasets, Ortiz-Santana et al. (2013) showed that the *Postia* group falls into two main clades (core postia clade, sarcoporia clade) with the 'core postia clade' comprising four subclades: /spongiporus, /oligoporus, /postia sensu stricto, and /spongiporus-undosus). They accepted *Oligoporus*, *Postia*, and *Spongiporus* as separate genera and also confirmed the independence of *Gilbertsonia*, *Rhodonia*, *Ryvardenia*, and *Taiwanofungus.*

Currently, the validity of *Postia* Fr. is generally accepted and the genus name is widely used (e.g., Buchanan & Ryvarden 2000, Wei & Dai 2006, Dai & Hattori 2007, Dai et al. 2009, Hattori et al. 2010, Yuan et al. 2010, Cui & Li 2012, Shen et al. 2014). The most recent molecular studies (Pildain & Rajchenberg 2012, Ortiz-Santana et al. 2013) place *Postia caesia* in *Postia* in the restricted sense while within *Postia* the *P. caesia* complex forms a separate branch. The phylogenies do not support the *P. caesia* group as a separate genus (as suggested by McGinty in 1909) but do support the group as a subgenus within *Postia*. Therefore the following combination is proposed:

Postia subg. ***Cyanosporus*** (McGinty) V. Papp, **comb. & stat. nov.**

MycoBank MB810903

≡ *Cyanosporus* McGinty, in Lloyd, Mycol. Notes 33: 436 (1909)

Type: *Boletus caesius* Schrad., Spic. Fl. Germ.: 167 (1794) [≡ *Postia caesia* (Schrad.) P. Karst.]

Basidiocarp medium- to small-sized, whitish when young, becoming more or less grey to blue tinted. Basidiospores narrow, small, faintly amyloid in Melzer's reagent. No chlamydospores in culture.

Species in the *Postia caesia* complex

Within the *P. caesia* complex, five species (*P. alni*, *P. caesia*, *P. luteocaesia*, *P. mediterraneocaesia*, *P. subcaesia*) are accepted in Europe (Bernicchia 2005, Niemelä et al. 2001, Pieri & Rivoire 2005, Ryvarden & Gilbertson 1994). However, other uncertain taxa described from Europe also probably belong to the *P. caesia* complex and are considered synonyms of *P. caesia* (e.g., *Bjerkandera ciliatula*, *Boletus candidus*, *B. coeruleus*, *Polyporus caesiocoloratus*).

Based on the original description (Britzelmayr 1893), *Polyporus caesiocoloratus* Britzelm. grew on a *Picea* trunk and had spores 0.7–1 µm wide. Apart from spore size, no other feature was mentioned that would distinguish the taxon from *P. caesia,* suggesting that the two species are identical.

Boletus candidus Roth is also a potential synonym of *P. caesia*, although in the original description Roth (1797) wrote that the pileus is white-yellow, with white margin and has a brown-blue pore surface.

Postia luteocaesia (A. David) Jülich is a rare Central European species, which grows exclusively on *Pinus;* its main morphological feature besides the typical blue greyish discoloration is the additional bright yellow colour of the basidiocarp (Niemelä et al. 2004, Ryvarden & Gilbertson 1994).

David (1974), who described *Tyromyces subcaesius* [≡ *Postia subcaesia* (A. David) Jülich] from deciduous trees, proved by interfertility tests that it differs genetically from *P. caesia*. With the exception its host preference, the only features separating *P. subcaesia* from *P. caesia* are the narrower spores and typically more whitish basidiocarp (Ryvarden & Gilbertson 1994).

Boletus coeruleus Schumach. (Schumacher 1803) is morphologically close to *Postia caesia* but grows on *Quercus*. Fries (1821) regarded this species as a variety of *P. caesia*, while other mycologists (e.g., Persoon 1825, Quélet 1886) considered it a distinct species. However, Bernicchia et al. (2008) reported *P. caesia* also from *Quercus cerris*, *Q. ilex*, and *Q. pubescens,* suggesting that the host is not sufficient to characterize a species.

Bjerkandera ciliatula P. Karst., described from Finland, is mentioned among the synonyms of *P. caesia* (Robert et al. 2014). However, Karsten (1887) described the type basidiocarp as small (1–1.5 cm) and growing on *Alnus incana*. These

characteristics, combined with a basidiospore width of 1 µm, suggest a closer relationship with *P. alni* than with *P. caesia*. *Postia mediterraneocaesia* M. Pieri & B. Rivoire also has a small (≤25 mm long) basidiocarp, but its pileipellis hyphae are encrusted and the basidiospores are wider (1.45–1.68 µm). It seems to be a southern European and Mediterranean species that grows on both conifers and hardwoods (Pieri & Rivoire 2005).

Tyromyces caesiosimulans G.F. Atk. was described from North America from an unknown substratum. Although Atkinson (1908) wrote that the new species resembled *Polyporus caesius* [≡ *Postia caesia*], it differs by having globose, pedicellate spores. This basidiospore shape is not known in the complex, and a type study is necessary to clarify the taxonomic position of this species.

Patouillard & Lagerheim (1892) described *Polyporus caesioflavus* from Ecuador. This species is morphologically very similar to *Postia caesia* and *P. subcaesia* (Ryvarden 1983). *Polyporus caesioflavus* is distinguished by narrower (7–9/mm) pores and a glabrous pileus surface (Loguercio-Leite et al. 2008). Carranza (1982) transferred this species to *Tyromyces* after studying the type specimen and collecting specimens from Costa Rica. Carranza's combination, which proved to be invalid (ICN, Art 41.4), was subsequently validated by Ryvarden (1983). Loguercio-Leite et al. (2008) later transferred *Tyromyces caesioflavus,* a brown-rot species (Carranza 1982), to *Oligoporus,* as *O. caesioflavus* (Pat.) Baltazar et al.

Corner (1989) described two *Tyromyces* species (*T. amyloideus*, *T. coeruleivirens*) from Malaysia (Mt. Kinabalu, Borneo), which were studied by Hattori (2002). Based on its olivaceous colour and allantoid (3–4.2 × 0.8–1 µm) slightly amyloid spores., Hattori (2002) considered *T. amyloideus* only a form of *P. caesia* s. lat., later accepting it as a synonym of *P. caesia* (Hattori et al. 2012). However, *P. caesia* s. str. has wider spores (1.3–1.7(–1.9) µm; Ryvarden & Gilbertson 1994, Niemelä 2013), suggesting that *T. amyloideus* may represent a distinct species. *Tyromyces coeruleivirens* also has a greenish pileus, monomitic hyphal system, and allantoid inamyloid basidiospores (Corner 1989, Hattori 2002). Morphologically similar to *T. amyloideus*, *T. coeruleivirens* has narrower pores (7–9/mm vs. 4–5/mm in *T. amyloideus*) and inamyloid, slightly longer (4–5 × 0.8–1 µm) basidiospores. Otherwise most characteristics (e.g., locality) are highly similar, and a taxonomic revision of these two species is needed.

Ryvarden (1988), who described *Oligoporus africanus* from Africa (Muramyya, Burundi), considered it as related to the *O. caesius* [≡ *Postia caesia*] group based on the basidiocarp type, hyphal system, and allantoid slightly amyloid spores. The main character that distinguishes *O. africanus* from *P. caesia*, *P. subcaesia*, and *P. luteocaesia* is the smaller spore size (3.5–4.5 × 1–1.2 µm) (Ryvarden 1988).

Despite the fact that *Oligoporus africanus, Polyporus caesioflavus, Tyromyces amyloideus,* and *T. coeruleivirens* have been accepted as closely related to the *Postia caesia* group ('core postia clade'), they have never been placed into *Postia*. I therefore propose the following combinations:

Postia africana (Ryvarden) V. Papp, **comb. nov.**
MycoBank MB810904
≡ *Oligoporus africanus* Ryvarden, Mycotaxon 31(2): 407 (1988)

Postia amyloidea (Corner) V. Papp, **comb. nov.**
MycoBank MB810905
≡ *Tyromyces amyloideus* Corner, Beih. Nova Hedwigia 96: 160 (1989)

Postia caesioflava (Pat.) V. Papp, **comb. nov.**
MycoBank MB810907
≡ *Polyporus caesioflavus* Pat., Bull. Soc. mycol. Fr. 8(3): 114 (1892)

Postia coeruleivirens (Corner) V. Papp, **comb. nov.**
MycoBank MB810908
≡ *Tyromyces coeruleivirens* Corner, Beih. Nova Hedwigia 96: 163 (1989)

Acknowledgements

I sincerely thank Prof. Dr. Solomon P. Wasser (Haifa, Israel) and Dr. Ivan Zmitrovich (Saint Petersburg, Russia) for pre-submission review. I am also grateful to Editor-in-Chief Dr. Lorelei L. Norvell (Portland, USA) and Nomenclature Editor Dr. Shaun Pennycook (Auckland, New Zealand) for the helpful remarks and suggestions. I wish to thank Anna Szabó and Bálint Dima for their valuable comments on the manuscript.

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